

# THE MATHEMATICS TEACHER

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## *Classified Index, Volume 76* *1983*

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 Algebra I, Apple II<sup>+</sup>, 48K, DOS 3.3. Sept., 440.  
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 Algebra II—Disk 3, Apple II<sup>+</sup>, 48K, DOS 3.3. Oct., 532.



Algebra Word Problems, PET/CBM, 16K, cassette. Jan., 64.

Algebraic Expressions: I. Rewriting Verbal Phrases as Algebraic Expressions; II. Evaluating Algebraic Expressions, Apple II, 48K, cassette, disk. Oct., 532.

Cactusplot, Apple II, 48K, DOS 3.3. Mar., 206.

Coordinate, PET, 8K, cassette. Sept., 441.

Curve Fitter, Apple II<sup>+</sup>, 48K, DOS 3.2/3.3. Jan., 66.

Data-Plot, Apple, 48K, DOS 3.2/3.3. Sept., 441.

Equations, PET, 16K, cassette (available Apple). Feb., 140.

Factoring, Apple II, 32K, DOS 3.2/3.3, Applesoft in ROM. Jan., 66-67.

Fundamental Skills for Chemistry, Applesoft, DOS 3.3. Mar., 206-7.

Graphing: Introduction to Graphing on the Coordinate Plane; Plotting Points on the Coordinate Plane, Apple II, 48K, cassette. Mar., 207.

Graphs, Mean, Median, and Mode, PET, 8K, cassette. Apr., 284-85.

Lessons in Algebra, Applesoft, 48K, DOS 3.3. Feb., 140-41.

Mathematics, vol. 1, Apple II, 48K, DOS 3.3 (available Atari 400/800). Oct., 535.

Micromath, Commodore PET/CBM, 16K, disk (available Apple II<sup>+</sup>). Feb., 141-42.

Quadratic Equations, Apple, 48K, disk (available PET, 16K, cassette). May, 372.

Quantitative Comparisons, Atari, 16K, cassette, disk. Mar., 208.

Read and Solve Math Problems, Apple II, 48K, cassettes, disks. Mar., 208.

Scientific Plotter, Apple II<sup>+</sup>, 48K, DOS 3.2/3.3. Jan., 68.

Solving Equations: Levels I, II, III, Apple II, 48K, disk, cassette. Feb., 142.

### Applications

Millionaire, Apple II<sup>+</sup> and III, 48K, DOS 3.3 (available IBM PC, Osborne, and others). Oct., 535-36.

Scientific Plotter, Apple II<sup>+</sup>, 48K, DOS 3.2/3.3. Jan., 68.

### Arithmetic

Adding Fractions, PET, 16K, cassette, disk. Mar., 206.

Arith-Magic, Apple II<sup>+</sup>, 48K, disk. Jan., 64-65.

Basic Math Drill, TRS-80, 32K, disk. Sept., 440-41.

The Big Math Attack, Apple II, 48K, DOS 3.2/3.3. Dec., 692.

Challenge Math, Apple II, 48K, DOS 3.3. Oct., 533.

A Computer Laboratory Manual for Number Theory, Apple, DOS 3.3. Feb., 139.

Decimal Skills, Apple II, Applesoft BASIC, 48K, DOS 3.3. Feb., 139-40.

Essential Math, vol. I, TRS-80, Level II or Model III BASIC, cassette, 16K, disk, 32K. Apr., 284.

Factoring Whole Numbers, Apple, 48K, DOS 3.3. Jan., 67-68.

Math Baseball, Apple II, 48K, cassette. May, 371.

Math Blaster! Apple II, 48K, disk. Dec., 693.

Math Invaders, Apple II, 48K, cassette, disk (available TRS-80 Model I or Model III, cassette, disk, Commodore PET, cassette, Atari, disk). May, 371.

Math Strategy, Apple, 48K, disk. Sept., 441.

Math for Everyday Living, Apple II, 48K, cassette, disk. Oct., 534-35.

Microphys Junior High School Mathematics Programs: Decimals I; Verbal Problems I—Numerical Relationships, Apple, DOS 3.3. Feb., 142.

Multiplying Fractions, PET, 16K, cassette (available TRS-80, Apple). Jan., 68.

Survival Math, Apple II, 32K, disk (available TRS-80, Model I or III, cassette). Nov., 627.

### Calculus

Calculus I, Apple II and PET (24K), DOS 3.2. Jan., 65-66.

Investigations in Integral Calculus, TRS-80, Level II or Model III BASIC, cassette, 16K, disk, 32K. Apr., 285.

muMath/muSimp-80, Apple II, 48K, disk. Sept., 441-42.

13 Calculus Programs, Apple II<sup>+</sup>, 16K, disk. Nov., 627.

### Computer Science

DISCOVER BASIC: Problem Solving with the Apple II Computer, Apple II<sup>+</sup>, 32K, DOS 3.3. Apr., 284.

PET BASIC, Course 201, PET 3032, 20K, disk. May, 371-72.

Records: A Student Grade-Record System, TRS-80, Model III, 32K, disk. Feb., 142.

Using Your PET, Course 203, PET 3032, 20K, disk. May, 372.

### Games and Puzzles

Concentration and Taxing, PET BASIC, 8K, cassette, disk (available Applesoft BASIC, 16K, TRS-80, Level 2 BASIC, 16K). Oct., 533-34.

The Distance Game, TRS-80, 16K, cassette. Nov., 626.

Math Baseball, Apple II, 48K, cassette. May, 371.

Math Invaders, Apple II, 48K, cassette, disk (available TRS-80 Model I or Model III, cassette, disk, Commodore PET, cassette, disk, Atari, disk). May, 371.

Mathematics, vol. 1, Apple II, 48K, DOS 3.3 (available Atari 400/800). Oct., 535.

Millionaire, Apple II<sup>+</sup> and III, 48K, DOS 3.3 (available IBM PC, Osborne, and others). Oct., 535-36.

Moptown, Apple II<sup>+</sup>, 48K, disk. Mar., 207.

SOFTSWAP Apple Dissemination Disk #1, Apple, DOS 3.3 (available PET, TRS-80, Atari, and Compucolor). Nov., 627.

Survival Math, Apple II, 32K, disk (available TRS-80, Model I or III, cassette). Nov., 627.

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Bumble Plot, Applesoft, 48K, DOS 3.3. Oct., 532-33.

The Distance Game, TRS-80, 16K, cassette. Nov., 626.

Geometry, Apple II<sup>+</sup>, 48K, DOS 3.3. Nov., 626.

Geometry—Disk 3, Apple II<sup>+</sup>, 48K, DOS 3.3. Nov., 626.

Junior High Geometry, Apple II and Applesoft, 32K, DOS 3.3. Feb., 140.

Mathematics—vol. 3 Geometry, Apple II, 32K, DOS 3.3. Mar., 207.

Plane Analytic Geometry, TRS-80, Level II or Model II BASIC, cassette, 16K. Mar., 208.

TRS-80 Color Logo, TRS-80 extended BASIC color computer, 32K, disk. Nov., 627-28.

### Word Processing

The Bank Street Writer, Apple II, 48K, DOS 3.3. Dec., 692.

Disk Color PILOT, TRS-80 color computer, 32K (available Tape color PILOT). Dec., 692-93.

ECS Computerized Gradebook, Apple II<sup>+</sup>, DOS 3.3. Oct., 534.



EXAMS, TRS-80, disk. Dec., 693.  
 Math Worksheet Generator, TRS-80, Model I or Model III, 16K, cassette. Mar., 207.  
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 A Linguistic Approach to Learning Mathematics Vocabulary. Oct., 488-90.  
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 Personal Glimpses from Two Gifted Students. Apr., 236-37.  
 Results of the Third NAEP Mathematics Assessment: Secondary School. Dec., 652-59.  
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 A Shortage of Mathematics Teachers in Houston. Dec., 644-45.  
 What Every Secondary School Mathematics Teacher Should Read—Twenty-four Opinions. Feb., 128-33. *See also* May, 308.

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Common Difficulties with Probabilistic Reasoning. Nov., 565-70.

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Using Football to Teach Probability. Nov., 585-87.

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## Statistics

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Challenges for Enriching the Curriculum: Statistics and Probability. Apr., 268-69.

"Easy" Statistical Exercises. Feb., 101-4.

A Simplified Approach to Correlation. May, 332-36.

Teaching Descriptive and Inferential Statistics Using a Classroom Microcomputer. May, 318-22.

## Teacher Education

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Microcomputer Unit: Graphing Straight Lines. Mar., 181-86. See also Sept., 398.

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Star Trek: A Construction Problem Using Compass and Straightedge. May, 329-32.

Triangles, Rectangles, and Parallelograms. Feb., 112-16.



(Continued from page 701)

$$x = \frac{\log(5/3)}{\log 4},$$

and the student is assured by the instructor, but rarely by the author of the text, that the two answers are the same. We can show that if  $a, b, c$ , and  $d$  are positive real numbers,  $c \neq 1$  and  $d \neq 1$ , then

$$\frac{\log_c a}{\log_c b} = \frac{\log_d a}{\log_d b}.$$

The justification is based on the change-of-base formula found in most algebra texts (for example, *College Algebra* by W. Heming and D. Varberg [Englewood Cliffs, N.J.: Prentice-Hall, 1980, p. 239]). It asserts that if  $a, c$ , and  $d$  are positive real numbers and  $c \neq 1$  and  $d \neq 1$ , then

$$\log_d c \log_c a = \log_d a.$$

Thus

$$\begin{aligned} \frac{\log_c a}{\log_c b} &= \frac{\log_d c \log_c a}{\log_d c \log_c b} \\ &= \frac{\log_d a}{\log_d b}. \end{aligned}$$

The change-of-base formula, and other properties of logarithms, can be used to establish a large number of logarithmic identities. Not all these identities are as practical as the one in the theorem, but establishing these identities can give algebra students needed practice in handling theoretical properties of logarithms.

In the following list of identities, it is assumed that all bases are positive numbers not equal to 1 and that only logarithms of positive numbers are involved.

- $\log_b m \log_m b = 1$
- $\log_b m = 1/\log_m b$
- $\log_a b = \ln b / \ln a$
- $\log_a m = (1/b) \log_b m$
- $\log_a m = 1/(b \log_m a)$

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## Tribonacci formula

Readers who enjoyed the Fibonacci formulas presented by Lucille Kelly (November 1982) in "A Gen-

eralization of the Fibonacci Formulae" may also find the following formula concerning the "tribonacci" sequence to be of interest.

Let the sequence be defined by the following:  $T_1 = 0, T_2 = 0, T_3 = 1$ , and  $T_n = T_{n-3} + T_{n-2} + T_{n-1}$  for  $n \geq 4$ . Writing out a few terms of the sequence yields 0, 0, 1, 1, 2, 4, 7, 13, 24, ...

A formula for the sum of the first  $n$  terms of the sequence is

$$\sum_{i=1}^n T_i = \frac{1}{2}(T_n + T_{n+2} - 1).$$

Example:

$$\begin{aligned} \sum_{i=1}^7 T_i &= \frac{1}{2}(7 + 24 - 1) \\ &= \frac{1}{2}(30) \\ &= 15 \end{aligned}$$

The formula can be proved using mathematical induction. The formula holds for  $n = 1$ . Assuming that the formula holds for  $n = k$ , it can be shown that it holds for  $n = k + 1$ :

$$\begin{aligned} \sum_{i=1}^{k+1} T_i &= \sum_{i=1}^k T_i + T_{k+1} \\ &= \frac{1}{2}(T_k + T_{k+2} - 1) + \frac{2T_{k+1}}{2} \\ &= \frac{1}{2}[T_{k+1} + (T_k + T_{k+1} + T_{k+2}) - 1] \\ &= \frac{1}{2}(T_{k+1} + T_{k+3} - 1) \end{aligned}$$

The sequence can be generalized in the following manner: Let

$t_1 = a, t_2 = b, t_3 = c$ , and  $t_n = t_{n-3} + t_{n-2} + t_{n-1}$  for  $n \geq 4$  where  $a$  and  $b$  are nonnegative integers,  $c$  is a positive integer, and  $a \leq b \leq c$ . Challenge your students to find a formula for

$$\sum_{i=1}^n t_i.$$

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## Corrections

The correct price of the set of slides entitled "What Do You See?" is \$13.95. (See October 1983 review in "New Products," p. 37.)

The second "Problem of the Month" in September 1983 should have read, "A fly lands on the face of a die suspended in space. It then moves to an adjacent face. If the faces are labeled as shown in the figure below, what is the probability that the fly ends on the red face?" (Answer:  $1/6 \times 1 + 1/6 \times 1/2 = 1/4$ )

Brown	Yellow	Green
	White	
	Red	
	Blue	

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